

I claim:

1 1. A method for rendering a display on a computer system, the display having a
2 plurality of objects, the method comprising the steps of:

3 loading an index table in a secondary memory of the computer system, the index
4 table containing a plurality of entries directed to particular ones of the objects of the
5 plurality of objects, and the index table being derived from a modified quad tree
6 representation of the display, the modified quad tree consisting of a quad tree and a
7 balanced search tree;

8 retrieving, from the plurality of entries, information describing the particular ones
9 of the objects; and

10 rendering the display on the computer system as a function of the retrieved
11 information, the display being a two-dimensional representation of the retrieved
12 information.

1 2. The method of claim 1 wherein the loading of the index table is determined as a
2 function of a viewer capacity cap, the viewer capacity cap being a function of (a) a total
3 number of objects which can be displayed on the computer system and (b) a density
4 factor, the density factor being determined as a function of a number of objects per pixel
5 count.

1 3. The method of claim 2 wherein the modified quad tree includes a plurality of
2 nodes, each node having a plurality of cells such that each cell may hold information
3 about more than one object of the plurality of objects.

1 4. The method of claim 3 wherein the modified quad tree is derived as a function
2 of a topology of the display.

1 5. The method of claim 3 wherein the loaded index table contains entries for only
2 those objects within a viewing area defined by a user of the computer system.

1 **6.** The method of claim 3 comprising the further step of:
2 inserting objects in the index table by modifying the plurality of entries as a
3 function of (i) a cell id associated with a particular cell of the plurality of cells, and (ii) a
4 depth level associated with the plurality of cells.

1 **7.** The method of claim 6 wherein the topology is of a communications network.

1 **8.** A graphical display system comprising:
2 a secondary memory;
3 a processor for executing a user interface application program and for controlling
4 the operation of the graphical display system in accordance with the functions defined by
5 a plurality of program instructions of the user interface application program, the plurality
6 of program instructions defining the steps of:
7 (i) loading an index table in the secondary memory, the index table
8 containing a plurality of entries directed to particular objects of a plurality of objects of a
9 display, and the index table being derived from a modified quad tree representation of the
10 display, the modified quad tree consisting of a quad tree and a balanced search tree;
11 (ii) retrieving, from the plurality of entries, information describing the
12 particular objects; and
13 (iii) rendering a two-dimensional representation of the retrieved information;
14 and;
15 a monitor for displaying the rendered two-dimensional representation.

1 **9.** The graphical display system of claim 8 wherein the loading of the index table
2 is determined as a function of a viewer capacity cap, the viewer capacity cap being a
3 function of (a) a total number of objects which can be displayed on the graphical display
4 system and (b) a density factor, the density factor being determined as a function of a
5 number of objects per pixel count.

1 **10.** The graphical display system of claim 8 wherein the modified quad tree
2 includes a plurality of nodes, each node having a plurality of cells such that each cell may
3 store information about more than one object of the plurality of objects.

1 **11.** The graphical display system of claim 10 wherein the loaded index table
2 contains entries for only those objects within a viewing area defined by a user of the
3 graphical display system.

1 **12.** The graphical display system of claim 10 wherein the plurality of program
2 instructions defining the further step of:
3 inserting objects in the index table by modifying the plurality of entries as
4 a function of (i) a cell id associated with a particular cell of the plurality of cells, and (ii) a
5 depth level associated with the plurality of cells.

1 **13.** A machine-readable medium having stored thereon a plurality of instructions,
2 the plurality of instructions including instructions that, when executed by a machine,
3 cause the machine to perform a method of rendering a two-dimensional display, the two-
4 dimensional display having a plurality of objects, on a computer system by (i) loading an
5 index table in a secondary memory of the computer system, the index table containing a
6 plurality of entries directed to particular ones of the objects of the plurality of objects, and
7 the index table being derived from a modified quad tree representation of the display, the
8 modified quad tree consisting of a quad tree and a balanced search tree; (ii) retrieving,
9 from the plurality of entries, information describing the particular ones of the objects; and
10 (iii) rendering the two-dimensional display on the computer system as a function of the
11 retrieved information.

1 **14.** The machine-readable medium of claim 13 wherein the loaded index table
2 contains entries for only those objects within a viewing area defined by a user of the
3 computer system.

- 1 **15.** The machine-readable medium of claim 14 wherein the modified quad tree
- 2 representation of the information is derived as a function of a topology of the two-
- 3 dimensional display.